

Remarks:

Claims 2-19, 21-32, and 34-66 were pending in this application at the time of the Final Office Action. By this amendment, the pending claims are now 2-19, 21-32, and 34-74. Claims 2 and 35 have been amended to correct clerical errors from Amendment and Response A wherein the second instances of "rapid compressive gain", which were intended to be changed to "instantaneous compressive gain" by Amendment and Response A, were inadvertently left unamended. This amendment corrects that omission such that claim 2 and claim 35 now correctly recite "instantaneous compressive gain" throughout. Also, new claims 67-74 are being added. Support for the limitations of these claims can be found throughout the application, including, for example, page 9, lines 8-12, Figure 10, and Figures 12-16). Applicant is also submitting a replacement abstract that reflects the amendments previously entered. No new matter is added. Also accompanying this response is a Declaration submitted under 37 CFR 1.132 by inventor Julius L. Goldstein which details the proper interpretation of the term "instantaneous compressive gain" and explains why the Cummins and Stockham Jr. patents fail to render the claimed invention obvious.

In the Final Office Action, independent claims 2, 21, 35, 55, 60, 63, 64, and 65 were rejected for obviousness in view of the Cummins and Stockham Jr. patents. Claim 56 was rejected for obviousness in view of the Cummins, Stockham Jr., and Armstrong patents. Claim 59 was identified as allowable.

Applicant interprets the rejections of the independent claims as being based on the Examiner's interpretation of the claim term "instantaneous compressive gain" and its variants that are present in all of the rejected independent claims. The Final Office Action states that the Examiner disagrees with Applicant's point that the Cummins patent fails to teach instantaneous gain compression. On this issue, the Final Office Action states:

Examiner disagrees with such an assertion [that Cummins fails to disclose instantaneous gain compression] because of the following reasons: 1) No gain change is truly instantaneous. Any signal processing system encounters an inherent processing delay as the processor must compute output gain values for the inputted values. That process cannot take place instantaneously. As

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Applicant has described instantaneous gain compression as an input/output relationship which does not rely on previous inputs, Examiner has interpreted that feature as one in which a signal processor uses a memory to look up output gain values, does not use any averaging, but nonetheless is not totally instantaneous. 2) Cummins uses a memory to calculate gain values. As taught in the abstract and column 2 lines 44-48, the digital signal processor has a programmable memory with the desired amplification characteristics of the user. 3) The delay mentioned by Cummins in figure 4 is to align the input samples with the calculated gain values. The delay is necessary because of the inherent processing delay associated with looking up the gain values, as mentioned in point 1 above. (See Final Office Action, page 2, lines 4-18).

Applicant respectfully submits that the Final Office Action's interpretation of the claim term "instantaneous compressive gain" and its variants and the Final Office Action's position that the Cummins reference discloses instantaneous gain compression are both in error.

I. The Examiner must interpret the claim term "instantaneous compressive gain" in accordance with the ordinary meaning that would be attributed thereto by a person of ordinary skill in the hearing amplification device art; namely instantaneous compressive gain must be interpreted to mean a compressive gain wherein the compression is memoryless (number in/number out) such that the output does not depend upon previous inputs. In other words, instantaneous compressive gain is compressive gain wherein the output at any instant is a function of the input at a single instant in time.

As is well settled, "[c]laim terms are presumed to have the ordinary and customary meanings attributed to them by those of ordinary skill in the art." MPEP 2111.01 (Section II) (*citing Sunrace Roots Enter. Co. v. SRAM Corp.*, 67 USPQ2d 1438, 1441 (Fed. Cir. 2003); *Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 67 USPQ2d 1132, 1136 (Fed. Cir. 2003)). "It is the use of the words in the context of the written description and customarily by those skilled in the relevant art that accurately reflects both the 'ordinary' and the 'customary' meaning of the terms in the claims." MPEP 2111.01 (Section II) (*citing Ferguson Beauregard/Logic Controls v. Mega Systems*, 69 USPQ2d 1001, 1009 (Fed. Cir. 2003)).

In the context of the written description for this application and in view of the hearing amplification device art, Applicant respectfully submits that a person of ordinary skill in the art would not interpret the term "instantaneous compressive gain" such that it encompasses a

system as disclosed in Cummins wherein the compressive gain amount is slowly varying such that its gain will remain constant for a minimum of 1 to 2 milliseconds, independent of the sound level input.

As evidenced by the Declaration of Julius L. Goldstein enclosed herewith, Applicant respectfully submits that the proper meaning attributed to the term "instantaneous compressive gain" is a compressive gain wherein the input/output relationship is number in/number out; essentially, the compression is memoryless in that the output does not depend upon previous inputs. In other words, the output at any instant is a function of the value of the input at a single instant in time. In the digital realm, this means that the compressive gain amount can vary sample by sample of the input. In the analog realm, this means that the compressive gain amount can vary over a time span of the input that is smaller than the Nyquist interval. (See Declaration; paragraph 6). Thus, the "instantaneous" in "instantaneous compressive gain" does not refer to the speed or delay by which the amplifier output is produced from the amplifier sound input, but rather, as would be understood by a person of ordinary skill in the hearing amplification device art, the "instantaneous" in "instantaneous compressive gain" refers to nature by which the compressive gain depends only on the input amplitude at an instant. With the claimed invention, the compressive gain level can change from instant to instant as described above in the digital and analog realms.

This interpretation of "instantaneous compressive gain" is bolstered by Applicant's specification. Not only does the specification at page 9, lines 8-12 provide this explanation of the art-understood meaning for instantaneous compressive gain, but Figures 10 and 12-16 depict the gain and transducer functions as a function of instantaneous input u , wherein u is the "instantaneous input amplitude". (See e.g., Application, page 26, line 23; Figure 10; Figures 12-16).

Therefore, Applicant respectfully submits that the claim term "instantaneous compressive gain", when properly interpreted in accordance with how a person of ordinary skill in the art would understand the usage of that claim term in the context of the application, must be interpreted to mean a compressive gain wherein the input/output relationship is

number in/number out, essentially memoryless in that the output does not depend upon previous inputs. In the digital realm, "instantaneous compressive gain" means that the compressive gain amount can vary sample by sample of the input. In the analog realm, "instantaneous compressive gain" means that the compressive gain amount can vary over a time span of the input that is smaller than the Nyquist interval.

Even assuming arguendo that a person of ordinary skill in the hearing amplification device art would not understand "instantaneous compressive gain" to have this meaning, it should be noted that the claims must nevertheless be examined using this meaning for "instantaneous compressive gain" because Applicant has provided a clear definition for this term in the specification. (See MPEP 2111.01 (Section III); discussing the well-settled rule that an applicant may act as his own lexicographer such that when "an explicit definition is provided by the applicant for a term, that definition will control interpretation of the term as it is used in the claim" (*citing Toro Co. v. White Consolidated Industries Inc.*, 53 USPQ2d 1065, 1069 (Fed. Cir. 1999)).

II. The Cummins patent, when viewed alone or in combination with the cited Stockham Jr. patent, fails to disclose, teach, or suggest the use of instantaneous compressive gain because Cummins teaches the use of a compressive amplifier wherein the amplifier's gain can vary only every 1 to 2 milliseconds.

The Cummins patent is clear in that it fails to disclose instantaneous compressive gain. As explicitly set forth by Cummins:

The time constants of the non-linear amplifier ***over which the gain remains substantially unchanged*** is an important characteristic which affects its performance. The longer the time constant, the less compression of short term waveform changes is achieved. However, the ***shorter the time constant, the more distortion is introduced*** for a given expansion or compression ratio. In the system of the present invention, a time constant value of about ***1 to 2 milliseconds*** provides preferred performance. Time constants in this range allow compression up to about 3.3 to 1 and expansion down to about 1 to 2 while keeping distortion at an acceptable level. (See Cummins, col. 3, lines 18-31 (emphasis added)).

As explained in the enclosed Declaration, because Cummins teaches that there should be a 1 to 2 millisecond time constant during which the gain of the amplifier remains unchanged, Cummins by definition fails to disclose, teach, or suggest the use of "instantaneous compressive gain" in a hearing amplification device. Following the teachings of Cummins with an 8 kHz digital amplifier using a 1 to 2 millisecond time construct, the result will be that *the compressive gain remains constant for the duration of at least 18 to 36 input samples*, regardless of the values of those input samples during that time. This stands in stark contrast to the present invention wherein the "instantaneous compressive gain" means that the compressive gain can vary *sample by sample*. (See Declaration; paragraphs 7-8).

Furthermore, it must be noted that Cummins teaches away from the use of instantaneous compressive gain because Cummins teaches that if the compressive gain varies by intervals less than 1 millisecond, an unacceptable amount of distortion will be introduced into the system. (See Cummins; col. 3, lines 22-24 which are quoted above). Therefore, a person of ordinary skill in the art would not be motivated to modify the Cummins system with instantaneous compressive gain because Cummins teaches that, if the compressive gain varies over durations less than 1 millisecond, an unacceptable amount of distortion will be produced. (See Declaration, paragraph 9).

Accordingly, it is clear that the Cummins reference merely discloses conventional compressive gain wherein time constants are used to balance various performance and distortion considerations. (See Declaration, paragraphs 10-11).

III. The Stockham Jr. patent, when viewed alone or in combination with the cited Cummins patent, also fails to disclose, teach, or suggest the use of instantaneous compressive gain.

Applicant's reading of the Final Office Action leads Applicant to the conclusion that the Stockham Jr. patent has not been cited as teaching the use of instantaneous compressive gain in a hearing amplification device. Nevertheless, Applicant hereby points out that the Stockham Jr. patent is also deficient in this respect. The "multiplicative AGC" disclosed by Stockham Jr., as in Figure 1, comprises multiplication of the responses of linear bandpass

filters by slowly varying multipliers that are proportional to the gain specified for the current average input signal level. Stockham Jr. fails to disclose a second filter following the "multiplicative AGCs" that would be expected to help control any nonlinear distortion that would be produced if the gain was in fact instantaneous compressive gain. Having failed to disclose such a second filter, and in view of the silence of the Stockham Jr. patent with respect to instantaneous compressive gain, it is clear that the Stockham Jr. patent also fails to disclose, teach, or suggest the use of instantaneous compressive gain in a hearing amplification device. (See Declaration, paragraph 13).

IV. In view of the shortcomings of the Cummins and Stockham Jr. patents, Applicant respectfully submits that independent claims 2, 21, 35, 55, 56, 60, 63, 64, and 65 are patentable because the combination of Cummins with Stockham Jr. fails to disclose, teach, or suggest to one of ordinary skill in the art the use of instantaneous compressive gain in a hearing amplification device, much less the combination in a hearing amplification device of instantaneous compressive gain with an adaptive compression threshold.

As noted above in Sections II and III, the Cummins and Stockham Jr. patents fail to disclose, teach, or suggest the use of instantaneous compressive gain in a hearing amplification device. In fact, the Cummins patent explicitly teaches away from such a design because its teachings would lead one of ordinary skill in the art to conclude that instantaneous compressive gain would introduce an unacceptable amount of distortion into the hearing amplification device. Proceeding contrary to this conventional wisdom, Applicant has invented a hearing amplification device that employs instantaneous compressive gain. This implementation advantageously requires no adaptation to avoid overamplifying sudden increases in input sound levels. To control the distortion that is caused by the instantaneous compressive gain, the present invention uses an adaptive compression threshold, preferably in combination with the second bandpass filter of the BPNL configuration. The present invention thus provides excellent performance in a variety of sound environments. For example, with relatively clean speech, waveform compression can be targeted to strengthen relatively weak speech components and enhance its intelligibility. The instantaneous compressive gain of the present invention successfully provides this enhancement without gain adaptations for each

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speech syllable. When intense transient disturbances interfere with ongoing speech, the present invention provides gain compression for the disturbance without the conventional requirement for *slowly acting* gain adaptation (as is present in the Cummins and Stockham systems) and without the consequent temporary loss of sensitivity following the disturbance that is caused by the slowly acting gain adaptation. (See Declaration, paragraph 12).

Independent claims 2, 21, 35, 55, 56, 60, 63, 64, and 65 each recite the limitation of "instantaneous compressive gain" or some variation thereof. In view of the above-described shortcomings of the Cummins and Stockham Jr. patents with respect to these limitations, Applicant respectfully requests that the obviousness rejection of these claims based on the Cummins/Stockham Jr. combination be withdrawn (see Declaration paragraph 14). Applicant notes that claim 56 was rejected for obviousness based on the combination of Cummins/Stockham Jr./Armstrong, but in view of the statement on page 2 of the Final Office Action acknowledging that the Armstrong patent fails to disclose, teach, or suggest instantaneous compressive gain, this response will not reiterate the shortcomings of Armstrong in this regard.

V. New claims 67-74 are also patentable over the cited references for the same reasons expressed above in connection with claims 1-19, 21-32, and 34-66.

For the same reasons expressed above in Sections I-IV, Applicant respectfully submits that new claims 67-74 are also nonobvious with respect to the Cummins and Stockham Jr. patents.

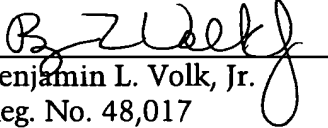
Conclusion:

In view of the foregoing, Applicant respectfully submits that the pending claims are patentable over the cited references. Favorable action is respectfully requested. If the Examiner intends to persist with the current rejection of the claims in view of this response, Applicant respectfully requests the Examiner to contact the undersigned by telephone at the number

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below to discuss the patentability of the claims in an effort to help move this application toward allowance.

Respectfully submitted,


Benjamin L. Volk, Jr.
Reg. No. 48,017
Thompson Coburn LLP
One US Bank Plaza
St. Louis, Missouri 63101
(314) 552-6000
(314) 552-7000 (fax)